Tour de Fab by Miriam Engle

By educating individuals, stimulating local economies, and increasing global collaboration, the Fab Lab phenomenon is going to make the world a more livable place, fostering both economic and environmental sustainability.

In January 2015, Madison Worthy and Miriam Engle quit their jobs in Colorado to relocate to Europe to explore the Fab Lab movement. We spent three months conducting research in Italy, Austria, Germany, and Scandinavia, and in April we procured refurbished bicycles to embark on a 3,000 kilometer long bike tour from Copenhagen to Barcelona following a route of Fab Labs through Denmark, northern Germany, the Netherlands, Belgium, France, and Catalonia. We were in Europe for over six months, and we visited around forty Fab Labs and spoke to more inspired, forward-thinking people than we could count.

Our mission is to create a documentary film, titled *Self-Made*, about the impact of Fab Labs on the sustainable future we aim to craft for ourselves. As driven Millennial-generation women, we recognize that we will be inheriting responsibility for the planet soon, and we feel compelled to act, to affect the direction of destiny.

Fab Labs are artfully dispelling fear of modern technology, teaching people invaluable twenty-first century skills, and encouraging diversity and interdisciplinary cooperation. The greater impact vastly exceeds the individual level. Collaboration that starts at the community level affects the entire globe. The Fab Lab movement may have begun as a social experiment, but the open source agenda will impact the international economy and local production and consumption will impact our collective environment.

We focused on four main topics over the course of our exploration. STEW stands for Sustainability, Technology, Education, and Women. These topics guided our questioning during the first three months of research before the bike tour launched. We originally approached our documentary as the story of sustainable industry, but very soon we realized that at the heart of this movement lie the creative communities. Precisely because inspired minds are questioning how to push the boundaries of technology, there is potential for both economic and environmental sustainability.

Our tour began in Copenhagen, where we visited FabLab Nordvest the weekend before we left. When asked to define a Fab Lab, Lab founder and manager Rasmus Grusgaard said, "It's a place where you can come as an inventor, citizen, or as a student and get hands on, get access to these kind of tools. That's one part of the answer, the other part is that it's a global network of people who believe in this ideology, a global network of open-access workshops." Grusgaard was facilitating hacker school, an elective available through Danish public education. About twelve boys aged ten to fourteen were learning how to build their own speakers and one-string guitars. "I always needed a place like this when I was a kid," Grusgaard mused.

On a glorious Monday morning we hit the road, cycling 85km with the help of a local friend. The next day, he accompanied us as far as Næstved, where we stopped in at FabLab Danmark. Workshop leader Maks Bragt took us on a tour of the machines and explained the importance of having access to digital fabrication. "My role is to facilitate workshops and teach people about the technologies, and the principles about product development in a Fab Lab [...] and making the bus drive," said Bragt. FabLab Danmark is widely known for its mobile component, a bus that travels all over Denmark, hosting workshops in schools and companies in regions that are too far from the source. If the mountain won't come to you.

Our first border, about 400km, and a last-minute visa application later, we were in Hamburg interviewing members of Fabulous St. Pauli. Co-founder and manager Axel Sylvester translated the Fab Charter and delved into the philosophy that makes the movement work, including how to stay economically solvent. There is no secret formula for success; what works for one Fab Lab may not work for another a mere 100km away. "What Fab Labs should do is projects in certain fields, for instance a couple of years ago, we found that it's necessary to solve problems of our environment, for recycling, for mobility, for gardening, [...] and the Fab Lab provides the room to do such things that are not necessarily economically sustainable in the first place," Axel said. "The Fab Lab scene is quite diverse," he said, referring to how Labs receive funding. We witnessed several different methods: Labs supported by institutions, such as universities, Labs supported by companies, Labs operating independently on member fees and donations, and even a couple budget-less Labs.

A few themes were becoming distinct. Every Fab Lab is different, funded independently and uniquely tuned to its community and particular environment, yet they mostly operate under the same moral code. Open source and affordable access are intrinsic qualities in attracting members. The social element resonated with us.

One more border later, we visited another mobile Fab Lab in Leeuwarden, Friesland. Frysklab has driven as far as Florence, Italy: "We got there in February this year," said Jeroen de Boer, one of the three Frysklab founders. "We didn't plan to go there, it just happened. We went to a big library innovation conference to talk about makerspaces in libraries." De Boer continued, "Libraries are forced to reinvent themselves.[...] Libraries typically survived by lending out books. Due to technology, this is changing. The whole business model of a traditional library is changing and libraries have to make a choice. [...] At the same time, you have this maker movement, which when you look at it, is basically about the same principles as being a librarian: so it's about sharing, it's about open information, it's about collaborating with each other. But there's one aspect in which they really differ, and that is this hands-on experience." Integrating ancient and modern learning locations is beneficial for both. Libraries won't become obsolete with the complete transition to digital, and the Fab Lab has a home where curious people will find it. "We are talking to other libraries and training them how to start their own Fab Lab, how to make it sustainable, how to work with the machines in one package, to really try to amplify this story of collaborating with the local makerspace."

We visited a total of ten Fab Labs in the Netherlands. At FabLab Amersfoort we encountered our first sustainability projects and a grassroots approach to funding. Amersfoort shines as an example within the Fab network of financial and environmental sustainability. Bart Bakker accompanied us to De War, a former match factory, now a "breeding ground for art, technology and sustainability," where we spoke to founder Harmen Zijp about De War's urban ecosystem: urban garden in the parking lot, beehive on the roof. A man builds solar-powered boats in the Fab Lab's backyard. The Fab Lab wastes little, prioritizing recycling and reusing. They approach their finances with a similar mindset. "For under 5,000 euros, we started a Fab Lab," Zijp said, "and we were the very first entirely grassroots funded Fab Lab in the world. This was a hack into the MIT model of starting a Fab Lab. It has had a few afterthoughts that we now have come to value a lot. One of them is that, we are entirely independent of subsidies, of sponsorships, which means no one can close us down; there is no economizing within the government, within the company, with any funding body, because we don't have any funders. So that's a great advantage. A second thing is that there's no money for buying licences with Microsoft, Apple, Adobe, which means that we were completely depending on open source software, which was a bit of a hard choice in the beginning. [...] This meant that we took this hardcore open source trek, which was not in the plan beforehand, it was not our objective to do it this way. Of course, we were open to it, but this way of financing actually forced us to take this route. And then we discovered that actually a lot of people found this extremely interesting. A lot of people--hackers, geeks, nerds who like to contribute to open source software--came to this Lab to do that. Then we found out that by choosing this route, we installed a huge magnet for really interesting, crazy people that come to this place to contribute to open source. That's been really interesting and also confronted us with a lot of the easily accepted common practices in many other labs or other environments where they do have the money to buy the licences and have the easy going goodies from big corporations."

Fab Labs are initiating a change in our relationship with production and consumption, and how we make products impacts how we make business. At the University of Rotterdam, Research Professor Peter Troxler spoke of the importance of integrating the open source agenda into business models. "Open source projects can be so much quicker than closed source projects, and you don't spend a lot of time and money on protecting what you've got, but really on sharing and building what's already there," Troxler said. Stadslab facilitator Manon Mostert - van der Sar agreed, stating, "I think it will be much harder in the future to keep knowledge for yourself. Making that harder, to make this boundary around yourself with not sharing, will also make you socially less interesting for other people. I really think it's not about keeping the data closed, it's about sharing the data and moving on. [...] Being an entrepreneur means you can work with new things and you can interpret all this new stuff and come up with new things, it's not about having this thing and selling it to hundreds of thousands of people. It's about making that one cool thing: people know you can make that cool thing, they will find you if they need to. But it needs a shift in thinking."

On a tip from Bart Bakker, our route turned south to FabLab Breda, where we interviewed founder Charlotte Jansen, one of the many female Lab managers we met, about the pilot class

she'd just facilitated for a program to instruct kids in digital fabrication. "The good thing about projects like these it's fun for both the boys and the girls, they both enjoy using the laser cutting machines, they're engraving their own name, or their own picture and it doesn't matter that it's technical. [...] Technology isn't necessarily difficult and should be available for everybody."

Another dynamic female manager welcomed us to FabLab Zeeland in Middelburg. After collaborating with Jeroen de Boer of Frysklab, Alinda Mastenbroek was inspired to establish a Fab Lab in the official public library of Zeeland. "[Frysklab] is a class example why libraries can help promote making in their community," Mastenbroek said. "[De Boer] has been inspiring for us to set up a Fab Lab here in Zeeland. It's cool that you can work on the same course--we, in the south in the Netherlands and he in Friesland, to share the knowledge in Fab Labs with the community." Many people who accidentally stumble upon the Fab Lab in the library will return a few days later with an idea for a project. De Boer's concept of the combined library-makerspace proves its effectiveness at FabLab Zeeland. Though the Fab Lab community is vast, diverse, and each Lab maintains autonomy to function as its local community most needs it to, the cohesion and collaboration that transpire inside the entire network do so precisely because each Fab Lab operates independently of strict rules and regulations. "We are similar because we participate in the same Fab Lab community; we have the same rules. You come in here and can freely use the machines, but you have to leave your design so that someone else can learn about it. But I think we are trying to be different because--and that is in every Fab Lab--the focus is on the local community. You do it for your own region and the people here, and not all the regions are the same," Mastenbroek said.

Fab Labs are exposing people to technology, dispelling fear of the unknown. They are encouraging places of learning where members are unafraid to fail. In the Netherlands especially, we were impressed by the emphasis on education, from informal and grassroots to higher and institutional. From kids building robots in the shipping container palace of Kaasfabriek in Alkmaar to university students learning how to 3D print model boats at Stadslab in Rotterdam, we encountered raw excitement and energy. The Fab-Lab-Library combo provides an entire community with ease of access to a range of methods of self-improvement through education. There is no simple method for measuring empowerment, but it's happening at every Fab Lab. As Charlotte Jansen expressed it, Fab Labs "should really be encouraging people to give it a try and find out themselves."

In Belgium, the arc of our questioning turned to how a Fab Lab can affect the entrepreneurial agenda. Is it possible to run a truly open source business or is that merely an oxymoron? At Timelab in Gent, we met Eugenia Morpurgo, an Italian designer creating Another Shoe, open source leather shoes. "The idea is that once the components are made, the future owner of the shoe will put it together and assemble it, so he understands how it is made and he will also repair it in the moment that it falls apart from the natural use of it," Morpurgo said. "We are trying to figure out how we can make it a physical, practical business just really of shoe production, and how we can bring the shoes in regular street shops, to kind of bridge this gap there is between the people that are very involved in the maker movement and just regular customers."

We brought the question of money with us to FabLab Leuven, where Leuven Lab manager Marc Lambaerts and FabLab Brussels manager Lieven Standaert shared a candid conversation about the business of financing a Fab Lab itself. Financial stability can be bought, but the most vibrant Fab Labs we visited seemed to have found it organically instead. "When you start a Fab Lab project, certainly when I was starting, it was easy to get government finance to start it up; you easily got 100,000 euros to start a Fab Lab. Then the problems start," said Lambaerts with a laugh. Standaert said, "We are running that Lab for our own, we're running it with money from the department, we don't have much money, but we can afford to run it, and then we can afford to open up the doors for everyone. But in the first place, it's our Lab, we're doing the stuff we're interested in and you're welcome to join. And I think that's what you need: you need a core group that runs the place. I really want to stay away from project funding because certainly, that runs out."

At FacLab in Gennevilliers near Paris, we collected a crew of Lab managers, Lab users, and local leaders to discuss the future of the Fab Lab movement. Sophia Manseri, town councillor of Gennevilliers in charge of feminism issues, highlighted the reason for drawing more women into technical fields: "What we know about women is that they're not raised to feel able to do things with their hands. [...] What we're trying to do is bring women in the FacLab so that they can learn to do stuff and feel entitled to do them. It's about autonomy, it's about self-esteem, and it's about really making women realize---and men too--that women can do things."

Ophelia Noor has been involved with Fab Lab culture for years, and expressed what we'd been witnessing on our journey. "I met the first group of people that created Fab Labs in France," she said. "What I'm seeing is that, each Fab Lab adapts to its environment. For instance, in the countryside, you have a network of little Fab Labs, in Brittany, you have tech-schools that joined with a grassroots organization of science education. Each situation is really different so you can't really define them. I think it's even better if we have different Fab Labs, different ways of doing things, but at the same time they have this common ideal." The movement has had time to mature, so what's next? How can we maximize the impact on the sustainable future? "I think that what the network is missing currently is a meeting of intermediate area, so for France we talk about regional meetings and make a two hour ride and meet," said Olivier Gendrin, who is trying to organize a French federation of Fab Labs to foster more collaboration between Labs. Organization is important as the movement expands, but Fab Labs should remain autonomous and independent to best serve the local community.

We're not the only team out there flitting from Fab to Lab, searching for both similarities and inconsistencies. In Lyon we connected with Etienne Moreau and Mathieu Geiler of MakerTour, two graduate students embarking on a tour of French Fab Labs and beyond in October. As the Fab Lab movement attracts more interest, it transitions out of its niche phase and into the mainstream. Our documentary Self-Made is designed to assist with this development, helping the movement grow bigger and stronger to maximize the positive potential. Bart Bakker equated our efforts to "two bees [that] wander from Lab to Lab, creating unintended a lot of coherence in

the community. Real bees are not aware of the service they provide to flowers."

Our whole trip came into existence around the bike tour, a fully sustainable mode of transport that enabled us to experience more deeply the communities we traveled through. After one last rain storm on our first day out of Paris, summer arrived with a tremendous heat wave. We witnessed Kellefabrik of Dijon in action teaching people about digital fabrication at two different weekend festivals, and attended the grand opening of a brand new Lab in Beaune, made possible due to a government donation of a 400m² historic building. We sailed through Lyon, where we discussed the economic benefits of a more organized national network with Pierre Aumont, founder and manager of Fabrique d'Objets Libres. "Does everyone have to be a maker?" Aumont asked. "What is interesting in Fab Lab: the consumer can find something for him. [...] I think that there is the possibility for the whole economy to change. The Fab economy is not only how to repair, it's how to create."

We arrived at LABSud in Montpellier after cycling four days straight through 38°C heat. Climate change is exhausting, especially when you're physically propelling yourself through it. Cookies are a remarkable source of fuel, but so is receiving fruit for your hard labor. At LABSud we met Aurélien Bontemps, building his own guitars right in the Fab Lab, and selling them. An artistic entrepreneur, Bontemps said through a translator, "Usually I work more traditionally, but with Fab Lab and the opportunities in the Fab Lab, it takes less time to do what I have to do. It's the first time I used laser cutting. I hope to do many more things with the machines here in the Fab Lab." We were reminded vividly of hacker school building one-string guitars at FabLab Nordvest, way back at the beginning of our journey. Fab Labs turn inclination into industry.

That may be a lovely sentiment, but it doesn't capture the contemporary urgency of the movement. From Montpellier, we cheated and found rideshares to Toulouse for a day, where Constance Garnier of Artilect, France's first Fab Lab, shared with us what she thinks is next for this movement: "Let's imagine that the ecological situation is getting worse, that there are going to be a huge migrations, because some parts of the world are not going to be livable anymore, the economic growth is not coming back, because when some things remain still to stagnate, maybe it's not anymore time to talk about a crisis. Maybe it's not a crisis, maybe it's a transition. [...] Now that we know Fab Labs can work, and that we know what are the challenges and how to make it work, we maybe should think more globally about what impact to have and how we take a part in this whole dynamic." Garnier said that the Fab Lab movement is now in its "teenage" phase. The first decade of Fab Labs appears to have focused on education and improving access. Garnier believes the movement's growth should correspond to a shift in focus to the "ecological."

Tour de Fab reached its final destination on July 13th: Barcelona, well known for pledging to become the first Fab City, fully sustainable within forty years. Along our 3,000km tour, we spoke to people who thought it would be totally possible, even within twenty years, and others, who claimed the pledge was more political maneuvering than actual dedication to sustainability. Either way, Barcelona awed us with its creative architecture and abundance of natural areas.

The city feels less like a macadam spread, more like an urban reserve in which humans have been invited to dwell.

Tomas Diez, director of FabLab BCN, helped launch the Green FabLab, about ten kilometers north of Barcelona. "Green FabLab is producing the tools and the means to actually get a closer dialogue between nature and technology," Diez said. "One of the main differences between a Green Fab Lab and a Fab Lab is: we are trying to look at the next step of those Labs right now that are using plastics and very harmful type of materials." Fab Labs are fantastic locations for self-improvement through education, excellent for fostering entrepreneurial spirit to encourage the peer-to-peer economy, but the story we set out to tell all those months ago--the story of sustainable industry--is not the current Fab Lab story. In 2015, sustainability is unfortunately not a central focus of most Fab Labs.

Diez envisions a sustainable future at the Green FabLab: "We try to use all the materials from the natural resources that we have here, and we are also looking into the next step of fabrication, which is not only to make things, but actually to grow things." This century should be one of grand experimentation, so let's experiment in the right direction by minimizing waste, cutting transportation cost, and creatively using and reusing the resources we find in our immediate proximity.

We visited about two dozen Fab Labs in six countries by bike over the course of three months. We've cycled upon several conclusions. Firstly, that the structure of each Lab must reflect the community. Individual Labs and the network should stay unincorporated and open source. Secondly, maintaining open access to knowledge and tools will empower community members to improve the collective quality of life through education. Thirdly, the rapid expansion of technology in the twenty-first century makes it easier than ever to share and collaborate, and entrepreneurs can take advantage of local markets all over the world to produce things, providing consumers with higher quality products. Paraphrasing Pierre Aumont of Lyon, "Not everyone has to be a maker, but everyone is a consumer." Fab Labs help consumers make better choices. Fourthly. It will take prodigious creativity to find solutions to the planet's most pressing problems. The Fab Lab movement is too vast to collapse. By educating individuals, stimulating local economies, and improving global communication, this phenomenon is going to make the planet a more economic and environmentally sustainable place to live.